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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/550,643	09/23/2005	Kunihiko Iwamoto	PRM-0052	1946
23413	7590	06/28/2007		
CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002			EXAMINER RODELA, EDUARDO A	
			ART UNIT 2826	PAPER NUMBER
			MAIL DATE 06/28/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/550,643	IWAMOTO ET AL.	
	Examiner	Art Unit	
	Eduardo A. Rodela	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 April 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7 is/are allowed.
- 6) ☒ Claim(s) 1-5 and 8 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 9/23/05 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/23/05 and 5/22/06</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the Applicant's Arguments submitted April 18, 2007.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Li (US 2005/0280104).

Regarding claim 1, Li shows in Figure 10, a semiconductor device comprising:

a semiconductor substrate [202];

a gate insulating film [GD] formed on the semiconductor substrate [202]; and

a gate electrode [G] formed on the gate insulating film [GD],

wherein the gate insulating film is a layered film including a plurality of nitrogen-containing metal compound layers having nitrogen atoms [paragraph 0037,0038]. It is noted that the limitations of the gate insulating film having nitrogen atoms being "diffused therein" is considered to be a process limitation that carries no patentable weight because the current claim is directed to a device structure, therefore a "product

by process” claim is directed to the product, and no matter how the structure is actually made, it is the final product which must be determined in a “product by process” claim, and not the patentability of the process. The presence of process limitations on product claims, which product does not otherwise patentably distinguish over prior art, cannot impart patentability to the product. *In re Stephens* 145 USPQ 656 (CCPA 1965).

Regarding claim 2, Li shows in Figure 10, Li shows in Figure 10, the semiconductor device according to claim 1, wherein the plurality of nitrogen-containing metal compound layers each contain an element selected from the group consisting of Hf, Zr, and Si [paragraph 0038].

Regarding claim 3, Li shows in Figure 10, a semiconductor device comprising:
a semiconductor substrate [202];
a gate insulating film [GD] formed on the semiconductor substrate [202]; and
a gate electrode [G] formed on the gate insulating film [GD],
wherein the gate insulating film [GD] is a layered film including a plurality of nitrogen-containing metal compound layers having different nitrogen compositions ($1 - q$), expressed by the following equation, $M_p M'_{1-p} O_q N_{1-q}$ where $1 \geq p \geq 0$, $1 \geq q \geq 0$, and M and M' each represent an element Hf [paragraph 0038].

Regarding claim 8, Li shows the semiconductor device according to claim 1, wherein the layered film is formed by atomic layer deposition [paragraph 0045].

Claims 4 and 5 are rejected under 35 U.S.C. 102(e) as being anticipated by Lim et al. (US 2007/0001241).

Regarding claim 4, Lim shows in Figure 7, a semiconductor device comprising:

a semiconductor substrate [53];
a gate insulating film [63,65,67] formed on the semiconductor substrate; and
a gate electrode [71] formed on the gate insulating film [63,65,67], wherein the gate insulating film is a layered film including:

a first metal compound layer containing a metal compound expressed by the chemical formula $M^1O_xN_{1-x}$ [paragraph 0011];

a second metal compound layer formed on the first metal compound layer, containing a metal compound expressed by the chemical formula $M^2O_yN_{1-y}$ [paragraph 0010]; and

a third metal compound layer formed on the second metal compound layer, containing a metal compound expressed by the chemical formula $M^3O_zN_{1-z}$, [paragraph 0011];

where $1 \geq y > x \geq 0$, $1 \geq y > z \geq 0$, and M1, M2, and M3 each independently represent an element selected from the group consisting of Hf, Zr, La, Al, Si, and Y [paragraph 0010,0011].

Regarding claim 5, Lim shows the semiconductor device according to claim 4, wherein:

$1 > Y > X > 0$ and $1 > Y > Z > 0$ hold; and

each of the first, second, and third metal compound layers is one selected from the group consisting of a metal oxynitride layer and a metal nitride layer [paragraphs 0010,0011].

Allowable Subject Matter

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Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art does not show the specified concentration of nitrogen in the dielectric layers.

Claim 7 is allowable since the prior art of record does not show the relationship between the 'r' and 's' values being non-integer values in conjunction with Oxygen / Nitride.

Fax / Telephone Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo A. Rodela whose telephone number is (571) 272-8797. The examiner can normally be reached on M-F, 9:00AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Eduardo A Rodela
Examiner
Art Unit 2826



SUE A. PURVIS
SUPERVISORY PATENT EXAMINER